

CHAPTER 6

PHYSICAL CHARACTERISTICS



The Great Miami River



INTRODUCTION

The natural capability of the land to accommodate development is a significant factor in land use planning. Natural environmental and physical conditions may determine the suitability of a site for various land uses. Development may become costly and public hazards introduced when development occurs in areas unsuited for a particular use or implemented without proper design and implementation.

DEVELOPMENT SUITABILITY ANALYSIS

“Development suitability analysis” is a process whereby the natural characteristics of the land are matched with the physical development needs of individual land uses. Figure 6-1, included at the end of this chapter, contains the Development Suitability Analysis for Soils Study conducted by Miami Valley Regional Planning Commission for the Troy planning area. It must be noted that Troy is serviced by central water and sewer infrastructure, while many of the conditions described in Figure 6-1 complicate development of on-site water and wastewater systems, which are not permitted in existing or future developments within Troy. This discussion though relates to a better understanding of the benefits of central utilities while helping to identify potential development factors for any given site’s particular situation. Development suitability for both residential and commercial/industrial land use types is broken into the following four categories:

Prime Rating

A *Prime Rating* of suitability for residential development requires slopes less than 12%, adequate bearing strength, good natural drainage, adequate depth to bedrock, and no flood hazard. Similar ratings apply for commercial/industrial development, except only slopes less than 6% are included.

Suitable Rating

A *Suitable Rating* for residential development requires slopes less than 12%, adequate bearing strength, and no flood hazard. These areas have constraints requiring moderately extensive efforts to insure adequate subsurface drainage and to prevent frost-heave where bedrock is less than five feet from the surface. Improvements are needed to address constraints.

Marginal Rating

Areas rated as *Marginal* for residential development have slopes less than 12%, adequate bearing strength, and no flood hazard. However, the very poor natural

drainage characteristics of soils within these areas can cause wetness problems of a more severe nature than ones ranked *Suitable*. More extensive drainage corrections such as grading of building sites and artificial drainage installations are required for these areas before they can be made appropriate to accept development. Similar ratings apply to commercial/industrial uses, except that areas rated as *Prime* or *Suitable* for residential development and having slopes between 6%-12% are rated as *Marginal*. Extensive earth-moving for large structures and parking lots makes those areas less easily developed. Improvements are needed to address constraints.

Not Recommended

Areas rated *Not Recommended* for either residential or commercial/industrial development have one or more of the following characteristics: a flood hazard, low bearing strength, and/or slope greater than 12%. Development should not be located within an area having this rating without adequately designed and normally expensive measures undertaken to address the particular hazard.

A number of soils are *Prime* (rated) for both residential and commercial/industrial development. This includes single types and variations of Eldean Loam, Eldean Silt Loam, Eldean Miamian-Complex Silt Loam, Martinsville and Ockley Loams, Ockley Silt Loam, Miamian Silt Loam, Warsaw Silt Loam, and Wee Silt Loam. A number of variations of Celina Silt Loam, Glynwood Silt Loam, Glynwood Clay Loam, and Miamian Silt Loam are classified *Suitable* for development.

TOPOGRAPHY

Topography is the general configuration of land surface, including its relief and the position of its natural and man-made features. Both topography and slope (see below) are important development considerations because they impact construction costs, risks from natural hazards such as flooding, as well as natural resources such as soils, vegetation, and physical features such as drainage capabilities and other details impacting design. Topography plays an important part in defining the aesthetic appeal of a given site compared with its intended purpose. Sites with considerable topographic variations may be quite appealing for a large lot residential development employing a variety of home styles and amenities, while that same site would not necessarily lend itself to the development of a large single floor industrial complex.

SLOPE

While topography is a measurement of elevation, slope is the percentage change in the elevation over a certain distance. The general topography of the Troy planning area is rather flat, with slopes of less than six percent covering almost the entire planning area. Only limited areas, often appearing as a single hillside transition from the lower ground elevations found along the Great Miami River flood plain to the higher areas of ground composed of relatively gentle slopes continuing further away from the River to the northeast and west/southwest, with a slope between six and 12 percent exist.

Slopes greater than 12 percent may pose a significant constraint to development or greatly impact the costs to develop. These areas are of very limited scope and are not a major limiting factor relating to any of the overall development pattern of Troy.

DRAINAGE

Due to the generally flat nature of the planning area, much of it is not naturally well drained. This has complicated the design of more recent developments located distant from the major drainage tributaries nearest the Great Miami River. Except for the development of the oldest parts of Troy, now protected by the MCD flood control system, earlier development was simpler when located in areas that tended to have better access to adequate drainage ways with slopes toward the nearby River. Now, growth is situated primarily at the fringe of the City limits where topography and slopes are much flatter and less defined drainage ways exist, causing storm water (See Glossary for storm water) management features to be designed and over-sized in order to make use of limited downstream field tile or channel capacities.

Since 1982 Troy has had a Storm Water Management Ordinance in place. Such an Ordinance has placed more controls on developments of all types since its adoption. The result has been a better managed system less subject to major flooding events' frequency and impact. As storm water knows no political boundaries, Miami County has adopted a similar set of storm water management controls. As growth continues around the flatter areas at the fringe of Troy, particularly to the west and southwest in Concord Township, it is becoming more evident that the implementation of a storm water utility within the City of Troy, such that it could be extended into and implemented in the adjacent Townships, is highly advantageous. While the many storm water control ponds and other features require an administrative accounting of their condition and operation, the benefits have been obvious. The potential "over-sizing" of such features in a newer development can be shown to be beneficial to downstream locations where open channels or piping systems cannot historically, adequately accept all the flow from upstream, and many such ponds become an amenity in a new

residential development or commercial/industrial site and are no longer regarded as a mandated nuisance or obstacle to such development.

Soils with a very poorly drained classification present moderate to severe limitations for both rural and urban development, particularly related to on-site water and septic system needs. Such soils require additional development expenses to insure that storm runoff does not pond in a manner that will cause damage, and that high water tables do not become a nuisance or hazard to structures.

An adequate drainage outlet for any new drainage system must be available within a reasonable distance. Additional cost may become an expensive or limiting factor when the natural drainage outlet is through an area that is already developed or may be under-sized.

On-site wastewater disposal systems allowed outside the City jurisdiction often require lowering the water table with curtain drains around the leach field and often require additional lengths of leach line. Development in such areas after being annexed to the City, complying with Troy rules and regulations and using central water and sewer systems allows for a more practical utilization of the land (smaller tracts than typical township or county zoning and health department requirements dictate); eliminates threats to ground-water pollution from improperly designed or operating on-site (septic) systems; allows for storm water run-off control to be better addressed than with larger lots (10 acres plus in the townships) that bypass all Miami County subdivision design criteria; and has a lesser impact on those on-site systems already existing beyond, but relatively near, such new developments inside the City limits. Given such soils and site conditions the utilization of central water and sewer systems like Troy's becomes the preferred and more cost effective manner of addressing development pressures; allowing the development of sites that otherwise could only marginally support development, if at all, given the above discussions; and avoiding costs and problems related to on-site water and sewage systems.

In Miami County, the soils listed as very poorly drained are also classified as "hydric" soils. Hydric soils are formed from water-related processes such as flooding and ponding and/or a water table at or near the surface for significant periods throughout the year. Hydric soils are also good indicators of conditions favorable for wetlands. The limitations mentioned above are less serious for soils rated as somewhat poorly drained. Hydric soils do not easily support the use of on-site (septic system) facilities, may suffer complications when addressing drainage and wells on-site, and should be highly discouraged from development without the presence of central utilities.

FLOODING HAZARD

Given that Troy requires the use of its central water and sewer systems by all new developments, potentially the next most important physical impact on any given site is its susceptibility to flooding and how that area of concern, design and costs are addressed.

Flood plains present severe limitations for development because they must employ costly building and landscape measures to insure that destructive damage does not occur to structures and property during a flood event. Flood hazard insurance for developments within flood plains can be expensive or possibly unavailable to some property owners. New construction within a typical flood plain as defined by the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program (NFIP), in which Troy is an active participant, is governed by design parameters, if not discouraged or banned, given the particular site involved.

Troy and its adjacent area are also influenced by the Miami Conservancy District (MCD) flood control program. MCD is the local agency responsible for a system of dams and retarding basins within the Great Miami River basin. The Taylorsville Dam on the Great Miami River is located in Montgomery County, but its retarding basin affects a large area of Miami County. The flood hazard area of this retarding basin is derived from spillway elevations of the dams and is represented in the FEMA flood insurance study for Miami County. The spillway elevation of the Taylorsville Dam is 818 feet above the mean sea level.

In addition, MCD has district flood easements that follow property lines and sometimes extend beyond the designated flood plain boundary listed in the Flood Insurance Study. MCD has indicated that as land is subdivided, the boundary of such easements is changed to more closely match property lines with the flood hazard area of each retarding basin. Development is generally permitted by MCD as long as it is above the spillway elevation, while local zoning may be more restrictive. The main section of the City, including the Central Business District, is south and west of the Great Miami River. Morgan Ditch enters the river from the west at the north end of the City. The Official Plan Flood (OPF) discharge in Troy is 78,000 cubic feet per second (cfs). The District maintains 3.5 miles of levees and 2.2 miles of improved channel in Troy. The right (west) bank levee begins on the south side of Morgan Ditch near Ridge Avenue. The levee runs east along the southern edge of Morgan Ditch 2,500 feet. After the levee crosses Elm Street, it turns to the southeast and follows the river a distance of 1.4 miles. The levee ends at high ground near East Main Street approximately 1,000 feet upstream from the S.R. 41 bridge. Several floodwalls and crest walls supplement the right bank levee in Troy. The left bank levee begins at Riverside Drive opposite the Riverside Cemetery. It progresses west, south and southeast 1 mile and ends at a point 500 feet east of the CSX Railroad bridge near the Municipal Water Plant. There are no OPF openings in Troy. The

levee along the north side of Morgan Ditch at the county fairgrounds does not provide OPF protection. The levee was built to provide a regular channel for Morgan Ditch and afford the fairgrounds the same level of protection that the old canal embankments provided along County Road 25A. The CSX Railroad bridge and the Harrison Street and Elm Street (County Road 25A) bridges cross the levee and Morgan Ditch within the flood protection feature. The Adams Street, Market Street, and CSX Railroad bridges cross the levees and Great Miami River within the flood protection feature. The S.R. 41 bridge crosses the river at the downstream end of the maintained channel. There is a low head dam, owned by the City, located within the improved river channel downstream from the CSX Railroad bridge near the end of Clay Street. After the 1913 flood, MCD was created and excavated an improved channel between the low head dam and the SR 41 bridge to provide adequate flow capacity. This channel will carry 48,700 cfs, or 62 percent of the OPF. The remaining flow will pass through the old river channel that winds around the northern and eastern edges of the Miami Shores Golf Course. During high water events, the levees are periodically observed for evidence of seepage, erosion, movement, slumping, and other indications of a problem.

NATURAL RESOURCES

Any time a new development is constructed, it affects the environment around it. Natural resources such as farmland and mineral resources should be considered and integrated into the design of the community.

Prime Farmland

Located in the fertile Miami Valley Region, Troy sits among some of the richest and most productive cropland in Ohio. It is important to note that when prime farmland is lost to other land uses, pressures may be placed upon the farming community to cultivate marginal lands that tend to be more erosion prone, drought-prone, and less productive. Cultivation of these marginal lands may result in higher costs to the farming community and society as a whole in order to maintain the productivity levels formerly obtained on prime farm lands.

Water Resources

One of the most important Natural Resources to be considered is that of water. Water resources include surface water, such as stormwater runoff, groundwater, and deep aquifers. The City of Troy enjoys its location over a clean, productive aquifer enabling it to use groundwater (wells) as its water supply source (also See Chapter 8). Troy residents and others also enjoy a variety of fishing and water recreation activities in this area, in its many ponds, streams and the Great Miami River.

Mineral Resources

The primary mineral resources found within Miami County as a whole are limestone, sand, and gravel. The importance of knowing the locations of these resources in land use planning is the fact they can only be mined where they are located. They cannot be moved like other land uses. Development over areas where these resources are located will preclude their use at a later time, unless the costly relocation of the overlying land uses is accomplished. Gravel operations exist in the southeastern corner of the City at present along Dye Mill Road.

Table 6-1 indicates soils which are a probable source of sand and gravel according to the Soil Survey of Miami County, Ohio. These include the various Eldean Loams, Ockley Silt Loams and many others. Soils that were formed from glacial outwash are considered a probable source of sand and gravel. Sand and gravel usually contribute to the stability of soil in the absence of water. However, water readily flows through sand and gravel. Much like the areas prone to flooding, these soils are concentrated almost exclusively on the southeastern side of the Troy planning area.